ARM Climate Research Facility/North Slope of Alaska/Adjacent Arctic Ocean Emergency Response Plan

1.0 Purpose

The Department of Energy operates climate research facilities on the North Slope of Alaska. One facility is located near the town of Barrow, another in the village of Atqasuk, Alaska. These research facilities include atmospheric-sensing instruments that measure cloud and other atmospheric properties as well as visible and infrared radiation. Shelters at these sites provide temperature-controlled environments for instruments and personnel. Sandia National Laboratories is responsible for managing these sites.

In addition to these multi-year fixed sites, the DOE ARM Program sponsors short-term experimental measurement campaigns. These campaigns typically require that instruments and support personnel are sheltered at sites of interest on the North Slope.

As relatively-remote climate observatories, these sites are necessarily vulnerable to extreme weather events. This document describes the planned responses to events of exceptional weather or other exceptional occurrences that are not treated in the sites' standard operating procedures or hazard analyses.

2.0 Emergency Response Plans

In many of the cases described below, an insignificant event can become an event that deserves the label "disaster" when the intensity or duration of a physical phenomenon increases. Snow flurries turn into blizzards, and the ability to discern the inflection point at which a situation changes to become dangerous is an acquired skill. It is extremely difficult to explicitly describe the differences between potentially-dangerous and insignificant situations for all weather and exceptional circumstances that might be encountered at these sites. In all cases, however, we urge our personnel to be conservative in making an assessment of danger, to draw on the knowledge of experienced local professionals whenever possible, and to err on the side of safety if there is any question about a situation that might be or might become dangerous.

The sections that follow list possible situations that may require emergency response. For each situation, the nature of the hazard is described and a range of hazard levels, from insignificant to major, are listed. Responses for each hazard level are listed. Mitigation steps are listed for each situation at the highest or major level.

2.1 Power Outages

Hazard:	Power outages on the North Slope of Alaska are potentially dangerous to personnel and equipment. Power outages typically mean heat and light are lost in buildings and/or instrument shelters. During winter months, interiors can quickly cool to the point where they are uninhabitable without heavy coats and winter clothing. As interior temperatures fall below 0 C, plumbing freezes, typically causing permanent damage to pipes, pumps, and other water system components. Some equipment, such as diesel engines or rotating electrical devices, may have trouble restarting once they fall below a threshold temperature.

Hazard Levels

Insignificant	Power outages lasting a few seconds to a few minutes are common events in Alaska as well as the lower 48 states. At the ACRF/NSA sites, Uninterruptible Power Supplies serve as buffers for outages of a few minutes or less. However, the transient voltage spikes associated with power fluctuations can damage equipment. Electrical and electronic equipment that may be sensitive to voltage spikes should be protected by electrical filters at the power input.
Response:	No response required.
Minor:	Power outages that last for more than a few tens of minutes will deplete the reserves of the UPS batteries. In these cases where power will be interrupted, instruments will require rebooting and verification of successful restarts.
Response:	Follow established restart procedures. A minor power outage will likely create four hours or more of additional work for the observers after power is restored.
Major:	Power outages that last for more than a few hours pose a risk to equipment and personnel. Loss of electrical power typically means loss of building heat and light. If interior temperatures drop too low, instruments and building utility systems may be damaged.
Response:	

Mitigation	Because extended power failure in winter would be a life-threatening event for the community, the North Slope Borough has taken steps to make it unlikely, at least in the towns of Barrow and Atqasuk themselves. However, power outages that last several days or more have occurred (for example Kaktovik village, January 2005). Extended power failure at the ACRF instrumentation sites are possible. Any event that would bring a power line down under severe weather conditions might result in an outage of 12 hours or more. We have purchased portable generator sets and electric heaters. In the event of an outage that lasts more than one hour, site personnel will contact the local power provider for an assessment of the outage cause and likely duration. If no information is available or if the power provider indicates that the outage is likely to continue for several more hours, heat and light will be provided to the ACRF shelters by portable generator set. A list of instruments and equipment that are vulnerable to malfunction at cold temperatures will be developed. That list will be used in case of restart following prolonged loss of heat in a shelter or building. As mentioned above, power spikes can happen when power is restored. Electrical and electronic equipment that may be sensitive to voltage spikes should be protected by electrical filters at the power input.

2.2 Medical Emergencies and Medical Evacuation

Hazard:	Medical facilities on the North Slope of Alaska have limited resources. Barrow has the Samuel Simmonds Memorial Hospital. Atqasuk has a clinic with EMT available, but no full-time doctor. EMTs in the villages have access to doctors at Barrow by phone. In the event of a significant injury or illness, ACRF personnel or visitors would need to be transported to medical facilities in Anchorage or Fairbanks. A visitor to ACRF required medical attention in Barrow and subsequent transportation to an Anchorage hospital in the recent past. North Slope Borough Search and Rescue, brought into action by the medical personnel at Barrow, handle medivac for residents and visitors. The cost of a medical evacuation is sometimes covered by medical insurance, but this must be verified with the insurance provider at the time of the medically-necessitated transportation.
Levels and Responses:	In the event of an injury, illness, or electrical shock, site personnel will contact medical staff at the hospital at Barrow (if at Barrow) or the clinic at Atqasuk, either directly, by telephone, or by radio. Medical personnel will determine the seriousness of the injury and illness, decide whether or not local facilities and treatment are appropriate, and arrange transportation or evacuation if necessary. Trained medical personnel will assess the hazard level.

Mitigation:	We require all personnel and visitor to the ACRF North Slope of Alaska sites to work in teams and carry communication equipment. In the event of injury or serious illness, or in the case of electrical shock, site personnel will contact the relevant medical staff or other emergency response personnel (and/or local North Slope Borough Department of Search and Rescue.)

2.3 Blizzard

Hazard:	Blizzards come in varying intensities and with different degrees of forewarning. They range from minor inconveniences to raging torrents of snow-laden air that make it impossible to see more than a few yards, and that can prevent one from reaching safety only a few tens of yards away. The key to an appropriate response is continual assessment as to the safety hazard involved in all proposed activities.

Hazard Levels

Insignificant	In this case, roads remain drivable with no immediate threat of being closed by drifting, and visibility remains good.
Response:	No change required in operations.
Minor:	In this case, there is a danger of drifting snow making road to instrumentation impassible to vehicles within an hour or two.
Response:	In this case, operations will be modified as judged appropriate to mitigate hazard (e. g.. perhaps cancel daily rounds and radiosonde launch, but continue other work at duplex)
Significant	There is a perceived danger of snow drifting that could make the road to town impassible within an hour or two; visibility marginal.
Response:	In this case, site operations will be suspended. Site personnel should return home if it is safe to leave the work site.
Major:	Drifting snow makes roads either impassible, or not known to be passable (danger of getting stuck part way). Visibility poor; wind chill makes walking dangerous or foolhardy.
Response:	Take shelter wherever one is presently located (Duplex, Great White, vehicle) and don't leave that shelter until the hazard has abated. If snowed in, wait until help arrives. Inform relevant individuals of one's situation (Site Facility Manager (Walter), family) by cell phone or radio. If one's situation is dangerous, call 911.

Mitigation: We require all staff and visitors to carry communications devices such as radios and cell phones while visiting or working at ACRF sites. In the event of a blizzard, anyone trapped temporarily in a building or ACRF shelter should be able to communicate with relevant personnel and emergency rescue personnel if necessary.

NSA staff can arrange snow removal operations on roads as required following a blizzard or snow drifting events. We have purchased a snow-blower for small snow removal jobs. We own and maintain two snow mobiles that could be used for evacuation following a blizzard.

2.4 Storm Surge

Severe storm surges are rare events in the vicinity of Barrow, somewhat like hurricanes along the Gulf Coast. When they do occur, serious property damage and loss of life is a possibility. The last major storm surge occurred in 1963. It crested at an estimated 11 ft above MSL, and flooded all of NARL as well as a good part of Barrow. Storms with associated "minor" surges that close the coast road between Barrow and NARL are now fairly common, particularly in fall. Climate warming has delayed formation of sea ice till later in fall, exposing the coast to accelerated erosion from fall storms. As a result, the community is planning to develop a "back road" connecting NARL to town.

Hazard Levels

Insignificant Predicted and/or actual storm surge that threatens no roads and produces no flooding.

Response: In this case, operations will be continued without modification.

Significant: Severe Storm Surge is predicted and/or beginning that may cut or flood the coast road.

Response: In this case, visitors and staff will follow advisories announced on Barrow radio station KBRW. Suspend Site Operations and return home if it is safe to do so. If a predicted Storm Surge would flood the vicinity of duplex, all equipment should be shut down and power at the duplex turned off before leaving.

Major Flooding at duplex beginning.

Response: In this case, all equipment should be shut down and power turned off at the duplex. Site staff and visitors will retreat to safety in building 360 (on pilings sufficiently tall that it is highly likely to remain high and dry).

Mitigation: We require all staff and visitors to carry communications devices such as radios and cell phones while visiting or working at ACRF sites. In the event of a Storm Surge, anyone trapped temporarily in a building or ACRF shelter should be able to communicate with relevant personnel and emergency rescue personnel if necessary.

Note that the instrumentation site at Barrow is at about 25 ft above MSL, and hence, not likely to be affected by storm surge.

2.5 Fire

Hazard and Levels: All fires will be treated as major hazards.

Response: Follow Sandia training directives with regard to Fire:

- Spread the alarm
- Call for help by dialing 911
- Only fight the fire (with extinguishers already in place) if it is safe to do so
- If it is not safe to fight the fire with extinguishers, leave the premises immediately.
- DON'T go back in to rescue valuables. If needed, aid others in getting out FROM OUTSIDE (via windows).
- If the outside weather itself provides a hazard as one happens to be dressed at the time of evacuation, seek shelter immediately (Building 360 if the fire is at the duplex)

Mitigation: Cell phones or radios will be used to call local fire emergency response teams.

2.6 Evacuation

Hazard and Levels: Some accidents or circumstances may require evacuation of personnel. Examples of such circumstances include emergency or forced landings by aircraft, road closures during spring thaw or tidal surges, and disruptions caused by ice breakup.

Response: Personnel will contact the Search and Rescue staff of the North Slope Borough for evacuation if needed.

Mitigation: Cell phones or radios will be used to call for personnel evacuation.